



California Education and the Environment Initiative

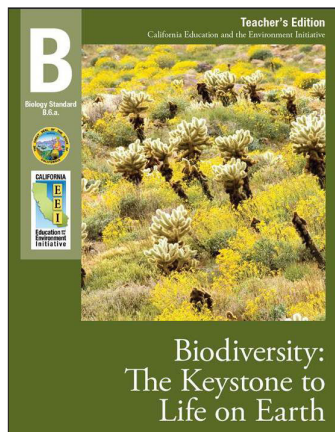
Increasing Environmental Literacy for K–12 Students...
Because the Future is in Their Hands



High School Biology/Life Science

B.6.a.—Biodiversity: The Keystone to Life on Earth

“Biodiversity: The Keystone to Life on Earth” uses California, one of Earth’s most biologically diverse regions, as a lens for learning about the biodiversity across the planet. This unit allows students to examine case studies showing how human actions can influence biodiversity and then study the implications of losing species. Finally, students read information and analyze maps related to the effects of human activities on the state’s biodiversity.



Next Generation Science Standards Correlation with the California Education and the Environment Initiative (EEI) Curriculum

By teaching this unit, students work towards mastery of the performance expectations for the disciplinary core ideas reflected in the summary chart below: HS-LS2 Ecosystems: Interactions, Energy, and Dynamics, HS-LS4 Biological Evolution: Unity and Diversity, and HS-ESS3 Earth and Human Activity.

	Disciplinary Core Ideas								
	HS-LS2			HS-LS4			HS-ESS3		
California Connection	✓		✓	✓	✓				
Lesson 1 - Students analyze a map of California bioregions and define “biodiversity” based on a reading.	✓		✓	✓			✓		
Lesson 2 - Students read about, discuss, and categorize ecosystem goods and ecosystem services.	✓	✓	✓	✓	✓	✓	✓	✓	
Lesson 3 - Students compare current and historical satellite images to evaluate habitat loss.	✓	✓		✓	✓		✓	✓	
Lesson 4 - Students read and summarize California case studies, and list individual and collective actions that can influence biodiversity.	✓		✓			✓	✓	✓	
Lesson 5 - Students read, discuss, and describe implications of the loss of biodiversity for natural systems and the availability of ecosystem services.			✓	✓	✓	✓	✓	✓	
Lesson 6 - Students read about and analyze maps related to effects of human activities on the state’s biodiversity.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Alternative Unit Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unit Assessment	✓	✓	✓	✓	✓	✓	✓	✓	✓
	SEP	DCI	CC	SEP	DCI	CC	SEP	DCI	CC

Correlation Chart Key

SEP (Science and Engineering Practices)

DCI (Disciplinary Core Ideas)

CC (Crosscutting Concepts)

Unit B.6.a Biodiversity: The Keystone to Life on Earth

Performance Expectations

HS-LS2: Ecosystems: Interactions, Energy, and Dynamics – strong correlation

PE 6: Evaluate the claims, evidence and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. Suggestion: Use the unit to have students study and discuss changes in California's biodiversity, evaluate the effects that both natural and human activities have on biodiversity in natural systems, and then present and write about how resulting conditions may affect the existing ecosystems.

HS-LS4: Biological Evolution; Unity and Diversity – strong correlation

PE 5: Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. Suggestion: Use the unit to have students evaluate how California's grassland ecosystems have changed over the past two centuries, due to both human and natural reasons, draw conclusions as to the impacts those changes had on species, and predict what future environmental changes will have on species populations including the extinction of some species and the emergence of new species.

HS-ESS3 – Earth and Human Activity – strong correlation

PE 4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Suggestion: Use the unit to expose students to efforts of human intervention on natural systems and evaluate the effectiveness of those efforts, and then to research and develop a potential solution to a local environmental stewardship concern.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and defining problems: after learning about Bioregions in California, students are led to ask and answer, “What are some of the components of our own bioregion?” (Lesson 1); after studying the loss of a keystone species (the Yellowstone wolves), students ask what effects a loss of a species in their bioregion would have in their own community (Lesson 5).</p> <p>Developing and using models: students analyze seven models (satellite images) to determine the effects of land use over time on biodiversity (Lesson 3); students study eight models and compare the human population increase in California to the environmental impacts for rare species in our state (Lesson 6).</p>	<p>LS2.C Ecosystem Dynamics, Functioning, and Resilience: students analyze how extreme fluctuations in conditions, such as the over-exploitation of wetlands, can challenge the functioning of an ecosystem's biodiversity (Lessons 2, 3, and 6).</p> <p>LS4.D Biodiversity: students evaluate how changes in environment have contributed to changes in biodiversity within natural systems, including the effects those changes have on species populations (Lessons 2, 3, and 6).</p> <p>ESS3.C Human Impacts on Earth's Systems: students study how human society impacts Earth's systems and the technologies and social regulations that help mitigate those impacts (Lessons 3, 4, 5 and 6).</p>	<p>Patterns: Students review patterns of habitat loss over a period of years, after both human and natural activities (Lesson 3); students compare population growth to resource consumption patterns (Lesson 6).</p> <p>Cause and Effect: Students study how changes in human activity affect the availability of ecosystem goods and services (Lesson 2); through the study of the Yellowstone wolf, students are able to see the effects of the loss of a keystone species on an ecosystem (Lesson 5.)</p> <p>Scale, proportion and quantity: Students are asked to determine how the increase in human population has increased the need for fresh water, and the impact that need has on the environment (Lesson 1).</p>

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Engaging in arguments from evidence: students are able to decide (through multiple case studies) what effects human intervention (either conservation or preservation) has had on natural systems in California (Lesson 4); students propose and present an action plan to help protect species or habitats in California (Alternative Unit Assessment).</p> <p>Obtaining, evaluating and communicating information: students obtain information through a general study of Bioregions in California, and specifically they learn and share about the Bioregion in which they live (Lesson 1); students study and make group presentations about environmental goods and services, such as wetlands providing flood protection and the link between genetic diversity and future food sources (Lesson 2); students review habitat loss in seven geographic regions on Earth, and then predict how California ecosystems may be affected by similar natural or human activities (Lesson 3); students review case studies about how people influence biodiversity through conservation and preservation, and they research and share how a current agency or group helps increase biodiversity in our natural systems (Lesson 4).</p>		<p>Systems and system models: Students study California's 10 bioregions as natural systems (Lesson 1); students compare ecosystem goods and services through the study and discussion of protection, pollination, medicines, ocean food webs and genetics (Lesson 2); students review global and local biodiversity hotspots in a review of eight regional models (Lesson 6).</p> <p>Stability and Change: Students study how changes in human activity affect the availability of ecosystem goods and services (Lesson 2).</p> <p>Influence of engineering, technology, and science on society and the natural world: Students study how humans use science and technology to help manage resources and create public policy that impacts biodiversity in California (Lessons 4, 5 and 6).</p>

(Footnotes)

¹ Each EEI unit highlights a small number of performance expectations, science and engineering practices, disciplinary core ideas, and crosscutting concepts. It is assumed that by the end of a school year, students will have had multiple opportunities to engage in all appropriate science and engineering practices, disciplinary core ideas, and crosscutting concepts and to achieve the performance expectations.